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10/814,050	03/31/2004	Ian A. Young	42P19119	5714

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EXAMINER
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SAYADIAN, HRAYR

ART UNIT	PAPER NUMBER
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2828

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/18/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	Application No. 10/814,050	Applicant(s) YOUNG ET AL.	
	Examiner Hrayr A. Sayadian	Art Unit 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 24 November 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) 3,5,6 and 18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,7-17 and 19-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

Claims 1-27 are pending in this application. This application is subject to an Election Requirement that was made Final in the previous Office Action. This Office Action maintains said Restriction Requirement and its Finality. Claims 3, 5, 6, and 18 have been withdrawn from examination on merits because they are directed to non-elected Species.

#### **Objection to the Amendment – New Matter**

1. The amendment filed 11/24/2006 is objected to under 35 U.S.C. §132(a) because it introduces new matter into the disclosure. 35 U.S.C. §132(a) prohibits any amendment from introducing new matter into the disclosure of the invention.

The independent claims have been amended to recite "a saturation fluence of the absorber is adjusted independently of a saturation fluence of the gain region to be less than the saturation fluence of the gain region." Applicants point to page 11, lines 4-7, and 23 and page 12, line 1 as providing support for this now recited feature.

Contrary to Applicants' contention however these pages do not support such a feature. Instead, the pointed to disclosure states:

[0048] Various embodiments to reduce the saturation fluence of the integrated absorber are presented herein. In one embodiment, the saturation fluence of absorber 206 may be reduced by adjusting the standing wave field intensities of the gain region 210 and the absorber 206 independently.

....

[0050] In another embodiment to adjust the standing wave field intensities, an intermediate mirror structure is used. .... The reflectivity for laser wavelength is chosen such that a coupled cavity may be obtained to adjust the field intensity in the absorber section independently of that in the gain region.

This disclosure supports a recitation of "a saturation fluence of the absorber is adjusted independently of a saturation fluence of the gain region." This disclosure however does not support the feature now recited in the claims, "a saturation fluence of the absorber is adjusted

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independently of a saturation fluence of the gain region to be less than the saturation fluence of the gain region." (Underlined by Examiner to draw attention to the new matter).

Applicants are required to cancel the new matter in their reply to this Office Action.

### **Objections to the Drawings**

2. The drawings are objected to under 37 C.F.R. 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the recited feature "a saturation fluence of the absorber is adjusted independently of a saturation fluence of the gain region to be less than the saturation fluence of the gain region" must be shown or the feature canceled from the claim.

Corrected drawing sheets in compliance with 37 C.F.R. 1.121(d) are required in reply to the Office action to avoid abandonment of the application. No new matter should be entered by either addition or deletion.

Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 C.F.R. 1.121(d).

The next Office Action will notify Applicants of the required corrective action if the changes are not acceptable.

This objection to the drawings will not be held in abeyance.

### **Objection to the Specification**

3. The following is a quotation of the first paragraph of 35 U.S.C. § 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 C.F.R. 1.75(d)(1) and M.P.E.P. § 608.01(o).

The claims now recite "a saturation fluence of the absorber is adjusted independently of a saturation fluence of the gain region to be less than the saturation fluence of the gain region," a feature not supported by the specification as originally filed.

Correction is required.

**Claim Rejections - 35 U.S.C. § 112**

5. The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1, 2, 4, 7-17, and 19-27 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. These claims now contains subject matter not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The "saturation fluence of the absorber [being] adjusted independently of a saturation fluence of the gain region to be less than the saturation fluence of the gain region" is not enabled.

7. Claims 1, 2, 4, 7-17, and 19-27 are rejected are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. These claims contains subject matter not described in the specification in such a way as to reasonably convey to one

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skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention.

**Supplemental Oath Is Required**

8. This application presents a claim for subject matter not originally claimed or embraced in the statement of the invention. Specifically, the original specification failed to disclose the "saturation fluence of the absorber is adjusted independently of a saturation fluence of the gain region to be less than the saturation fluence of the gain region."

A supplemental oath or declaration is therefore required under 37 C.F.R. §1.67. The new oath or declaration must properly identify the application of which it is to form a part, preferably by application number and filing date in the body of the oath or declaration. See M.P.E.P. §§ 602.01 and 602.02.

**Claim Rejections - 35 U.S.C. § 102**

9. Claims 1, 2, 4, 7, and 10 are rejected under 35 U.S.C. § 102(b) as being anticipated by WO 200159895, published 8/16/2001 (corresponding to EPO 1264373, published 12/11/2002, and corresponding to U.S. Pat. No. 6,735,234 to Paschotta et al., hereinafter "Paschotta"); element number and column and line reference will be with respect to the US patent).

**With respect to Claim 1:**

Paschotta discloses all of the recited features.

Specifically, Paschotta discloses: An apparatus, comprising: a lower mirror (for example, either of FIGs. 8 or 9, element 6; see paragraph starting column 8, line 52) and an output coupler (for example, either of FIGs. 8 or 9, element 12) defining a laser cavity; a gain region (for example, either of FIGs. 8 or 9, element 3) in a monolithic gain structure (element 3 is MQW; it and the neighboring layers are grown over the substrate 68) positioned in the laser cavity; and an absorber integrated with the gain region in the monolithic gain structure (see, for example, either of FIGs. 8 or 9, element 5), wherein a saturation fluence of the absorber is less than a saturation fluence of the gain region (see, for example, the paragraph starting column 4 line 21).

The recitation "a saturation fluence of the absorber is adjusted independently of a saturation fluence of the gain region to be less than the saturation fluence of the gain region" is intended use language and therefore does not further narrow the scope of the apparatus/system claims.

With respect to Claim 2:

Paschotta discloses the apparatus being a vertical cavity surface emitting laser.

With respect to Claim 4:

Paschotta discloses the absorber being aligned with a peak field intensity of a standing wave pattern generated during excitation of the gain region. See, for example, FIG. 10, maximum intensity on element 51.

With respect to Claim 7:

Paschotta discloses the absorber comprises a first quantum well layer (see, for example, the paragraph starting column 7, line 36) and the gain region comprises a second quantum well layer (see, for example, the paragraph starting column 6, line 18, describing the element 3 as being an MQW).

With respect to Claim 10:

Paschotta discloses the monolithic gain structure comprising the lower mirror. (See, for example, paragraph starting column 8, line 52, describing the "active-absorber-mirror element" 6).

**Claim Rejections - 35 U.S.C. § 103**

10. Claims 8 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of "Picosecond SESAM-BASED Ytterbium Mode-Locked Fiber Laser," by Gomes et al., IEEE Journal of Selected Topics in QE, V-10, NO. 1, pp 129-136 (2004) [hereinafter "Gomes"], and 1.5 micron Monolithic GaInNAs Semiconductor Saturable-Absorber ... , by Okhotnikov et al., Optics Letters, Vol. 28, No. 5, pp 364-366 (2003) [hereinafter "Okhotnikov"].

Paschotta discloses the second QW comprising InGaAs layer (see, for example, column 7, lines 13-19). Paschotta however fails to disclose the first QW comprising GaInNAs.

Gomes however discloses using SESAMs that comprise a GaInNAs QW well layer (See, for example, p.130, left column, starting with the fifth sentence in the second full paragraph, referring to the SESAM being grown similar to the SESAM described by Okhotnikov). Gomes also motivates using GaInNAs based SESAM by explaining that it has high contrast in nonlinear reflectivity variation

To benefit from the high nonlinear reflectivity of GaInNAs SESAM therefore it would have been obvious to modify the disclosure of Paschotta to have the first QW comprise GaInNAs.

11. Claim 9 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of "Passively Mode-Locked Laser Diodes with Bandgap-Wavelength Detuned Saturable Absorbers," by Kunimatsu et al., IEEE Photonics Technology Letters, Vol. 11, No. 11 (1999), [hereinafter "Kunimatsu"].

The recitation " ... to adjust the saturation fluence of the absorber" is an intended use of the electrodes coupled to the SESAM; it does not further narrow the claim.

Paschotta does not explicitly disclose plurality of electrical contacts coupled to the SESAM.

Kunimatsu however discloses that the electrical bias plays an important role in ultrashort pulse generation. (See, for example, the last sentence of the third paragraph starting in the left column; see, also FIG. 3).

To control the width of generated short optical pulses therefore it would have been obvious to modify the disclosure of Paschotta by controlling the electrical bias on the SESAM (which inherently would require electrodes being coupled to the SESAM).

12. Claims 11, 17, 20, 21 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of U.S. PG PUB 2002/0039376 to Kim et al. [hereinafter "Kim"].



Paschotta does not disclose the monolithic gain structure comprising the output coupler.

Kim however discloses a VCSEL having a monolithic gain structure comprising a micro-lens (output coupler). See, for example, the front page.

To focus light emitted from a VCSEL using a simple alignment structure having increased freedom in arranging elements and leading to sharply reduced number of required parts therefore it would have been obvious to modify the disclosure of Paschotta by having the monolithic gain structure comprise a micro-lens output coupler.

With respect to claim 17, Kim discloses (FIG. 2, and the corresponding text in the details description) the micro-lens 190 being on a spacer (175-170-171-160), part of which adjusts the position of the micro-lens with respect to the laser cavity.

With respect to claim 20, Paschotta discloses (FIG. 10) the absorber being aligned with a peak field intensity of a standing wave pattern.

With respect to claim 21, Kim discloses (FIG. 2, and the corresponding text in the detailed description) an electrode 151 coupled to the spacer and the electrode 155 coupled to the lower mirror, the electrodes used in electrically pumping the VCSEL.

13. Claim 12 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of U.S. PGPUB 2002/0110159 to Gerstenberger et al. [hereinafter "Gerstenberger"].

Paschotta does not disclose the apparatus further comprising a non-linear crystal optically coupled to change the wavelength of the laser output.

Gerstenberger however discloses an apparatus comprising a surface emitting semiconductor laser comprising a non-linear crystal 140 to convert the frequency of the laser. See, for example, the front page.

To convert the frequency of the laser therefore it would have been obvious to modify the disclosure of Paschotta by having the apparatus comprise a non-linear crystal.

14. Claim 13 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of U.S. Pat. No. 5,627,853 to Mooradian et al. [hereinafter "Mooradian"].

Paschotta does not disclose the apparatus comprising a thermal lens within the cavity.

Mooradian however discloses stabilizing the transverse spatial mode of a surface emitting semiconductor laser by having a pump beam cause a thermal lensing effect within the semiconductor material. See, for example the front page figure and the Abstract.

To stabilize the transverse spatial mode of the VCSEL therefore it would have been obvious to modify the disclosure of Paschotta by having the apparatus comprise a thermal lens.

15. Claim 14 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta.

Embodiment shown in FIGs. 8 and 9 of Paschotta do not disclose the apparatus comprising a heat sink thermally coupled to the lower mirror. FIGs. 1 and 7 however show a heat sink 29 thermally coupled to the lower mirror.

To cool the apparatus therefore it would have been obvious to modify the disclosure of Paschotta to provide for a heat sink thermally coupled to the lower mirror.

16. Claims 15 and 16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of U.S. Pat. No. 5,062,115 to Thornton [hereinafter "Thornton"].

Paschotta does not disclose forming an array of the disclosed VCSELS wherein a second output coupler, positioned proximate the lower mirror, forms a second laser cavity, which includes the absorber and the gain region.

Thornton discloses high density, independently addressable surface emitting semiconductor laser arrays, which share the substrate and the gain region. See, for example, the front page. Thornton also motivates forming and using VCSEL arrays. See, for example, the Background of the Invention in column 1.

To generate more emitted power at lower exciting power one would have been motivated to make and use a VCSEL array sharing the substrate and the gain region, and therefore it would have been obvious to modify the disclosure of FIG. 8 in Paschotta to make the VCSEL into an array of independently addressable VCSELS sharing the

substrate and the gain region, which inherently results in sharing the absorber disclosed in FIG. 8 of Paschotta.

17. Claim 19 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of Kim, further in view of Gomes and Okhotnikov.

The combination of Paschotta and Kim discloses (see, for example, rejection of claims 11, 17, 20, and 21, explained above in paragraph 9 of this Office Action) all of the features in claim 19 except for the absorber comprising at least one QW layer of GaInNAs.

Gomes however discloses using SESAMs that comprise a GaInNAs QW layer (See, for example, p.130, left column, starting with the fifth sentence in the second full paragraph, referring to the SESAM being grown similar to the SESAM described by Okhotnikov). Gomes also motivates using GaInNAs based SESAM by explaining that it has high contrast in nonlinear reflectivity variation.

To benefit from the high nonlinear reflectivity of GaInNAs SESAM therefore it would have been obvious to modify the combined disclosure of Paschotta and Kim by having the VCSEL comprise an absorber with a QW layer of GaInNAs.

18. Claims 22 and 24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of Thornton, further in view of U.S. PGPUB 2003/0113078 to Tatum et al. [hereinafter "Tatum"].

The combination of Paschotta and Thornton discloses (see, for example, rejection of claims 15 and 16, explained above in paragraph 13 of this Office Action) all of the features of claims 22 and 24 except for a fiber, optically coupling to the VCSEL array and receiving mode-locked laser outputs from the array.

Tatum however discloses a packaging scheme providing a high bandwidth communication system using plastic optical fiber to integrate a light source, such as more than one VCSEL. The advantage of the fiber is in being flexible, light, and possessing a very high bandwidth. See, for example, paragraph [0018] starting on the left column of page 2.

To communicate data through light, flexible, and wide band means therefore it would have been obvious to modify the combined disclosure of Paschotta and Thornton by having a fiber couple to at least the first and second VCSELs and receive their outputs.

19. Claim 23 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of Thornton, further in view of Tatum, further in view of Kim.

The combination of Paschotta, Thornton, and Tatum discloses (see, for example, rejection of claims 22 and 24, explained above in paragraph 15 of this Office Action) all of the features of claim 23 except for the first and second output couplers being monolithically structured with the gain region, absorber, and the lower mirror.

Kim however discloses a VCSEL having a monolithic gain structure comprising a micro-lens (output coupler). See, for example, the front page.

To focus light emitted from a VCSEL using a simple alignment structure having increased freedom in arranging elements and leading to sharply reduced number of required parts therefore it would have been obvious to modify the combined disclosure of Paschotta, Thornton, and Tatum by having the monolithic gain structure comprise a micro-lens output coupler.

20. Claims 25 and 27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of U.S. Pat. No. 6,628,695 to Aldaz et al. [hereinafter "Aldaz"].

Paschotta discloses (see, for example, rejection of claims 1, 2, 4, 7, and 10, explained above in paragraph 5 of this Office Action) all of the features of claims 25 and 27 except for disclosing a chipset and a clock.

Aldaz however discloses that the low jitter of the pulses from VCSELs enables their use in timing applications, such as providing clock signals for integrated circuits. See, for example, column 11, lines 44-47.

To benefit from the low-jitter of the mode-locked VCSEL disclosed by Paschotta therefore it would have been obvious to use the VCSEL disclosed by Paschotta in providing clock signals to integrated circuits, which inherently include chipsets.

21. Claim 26 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of Aldaz, further in view of Kim.

The combination of Paschotta and Aldaz discloses (see, for example, rejection of claims 25 and 27, explained above in paragraph 17 of this Office Action) all of the features of claim 26 except for the monolithic gain structure comprising the output coupler.

Kim however discloses a VCSEL having a monolithic gain structure comprising a micro-lens (output coupler). See, for example, the front page.

To focus light emitted from a VCSEL using a simple alignment structure having increased freedom in arranging elements and leading to sharply reduced number of required parts therefore it would have been obvious to modify the combined disclosure of Paschotta and Aldaz by having the monolithic gain structure comprise a micro-lens output coupler.

#### **Response to Applicants' Argument(s)**

22. Applicants' response to the previous Office Action amends the independent claims to recite "[the] saturation fluence of the absorber [being] adjusted independently of a saturation fluence of the gain region to be less than the saturation fluence of the gain region." Applicants' remarks, accompanying the amendments, contend that neither Paschotta nor the other applied references disclose or motivate the recitation introduced into the claims by the amendment, especially when the absorber is integrated into the gain structure.

Applicants' argument is fully considered but is found unpersuasive.

Specifically, Examiner notes that the language introduced into the claims of the present application is intended use language, which fails to further narrow the scope of the apparatus/system claims of the present application. And for the sake of compact prosecution, Examiner moreover notes that Paschotta, contrary to Applicants' contention, specifically motivates the saturation fluence of the absorber being, and describes how to have it be, adjusted to be lower than the saturation fluence of the laser gain medium. See, for example, Paschotta the paragraph starting in line 21 of column 4. And since the absorber and gain medium are different

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elements and have different physical nature, their gain saturation changes differently and therefore independently.

### CLOSURE

23. **THIS ACTION IS MADE FINAL.** Applicants are reminded of the extension of time policy as set forth in 37 C.F.R. 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 C.F.R. 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hrayr A. Sayadian whose telephone number is (571) 272-7779. The examiner can normally be reached Monday through Friday, 7:30 am – 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun O. Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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**MINSUN OH HARVEY  
PRIMARY EXAMINER**